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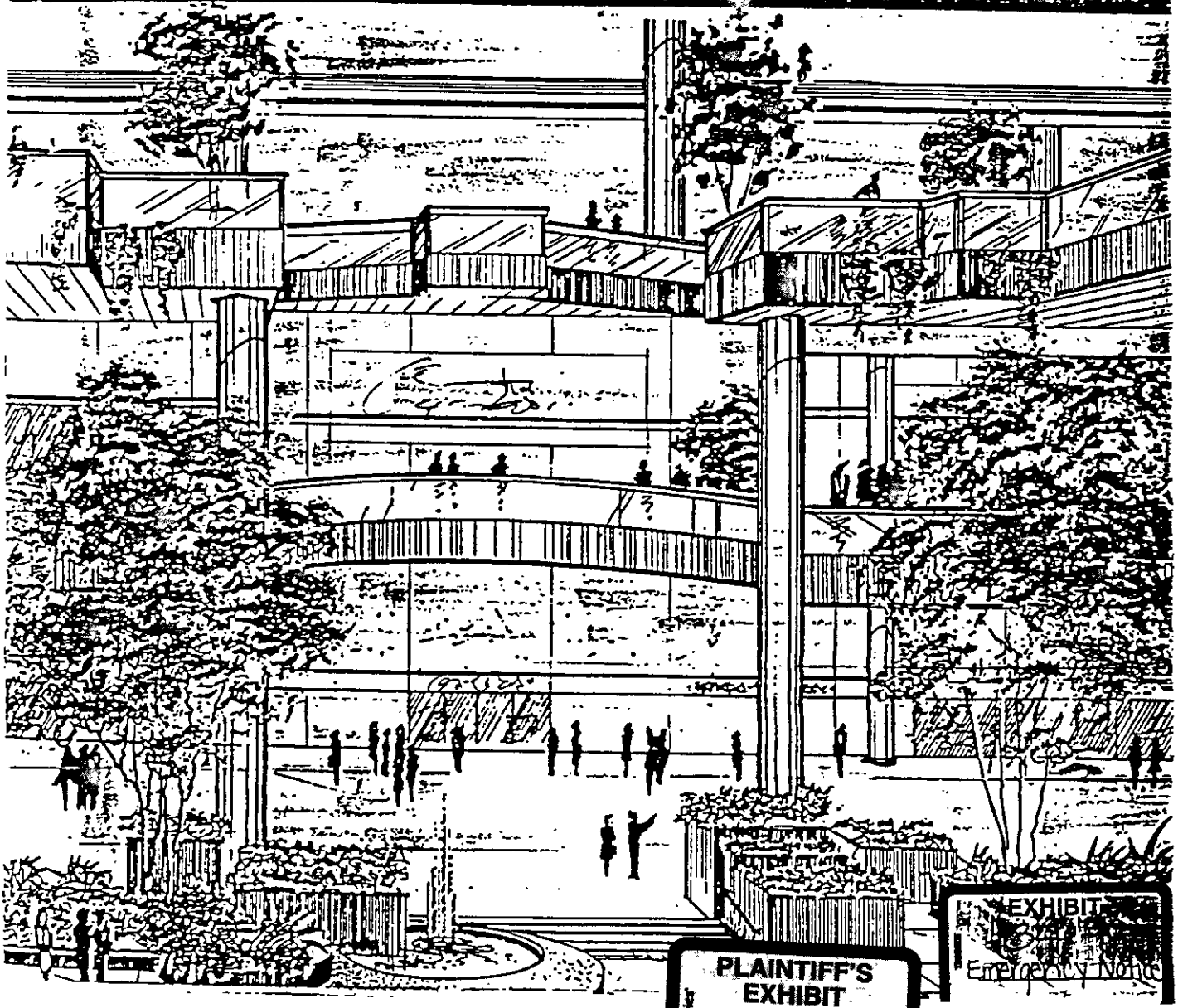
EPA

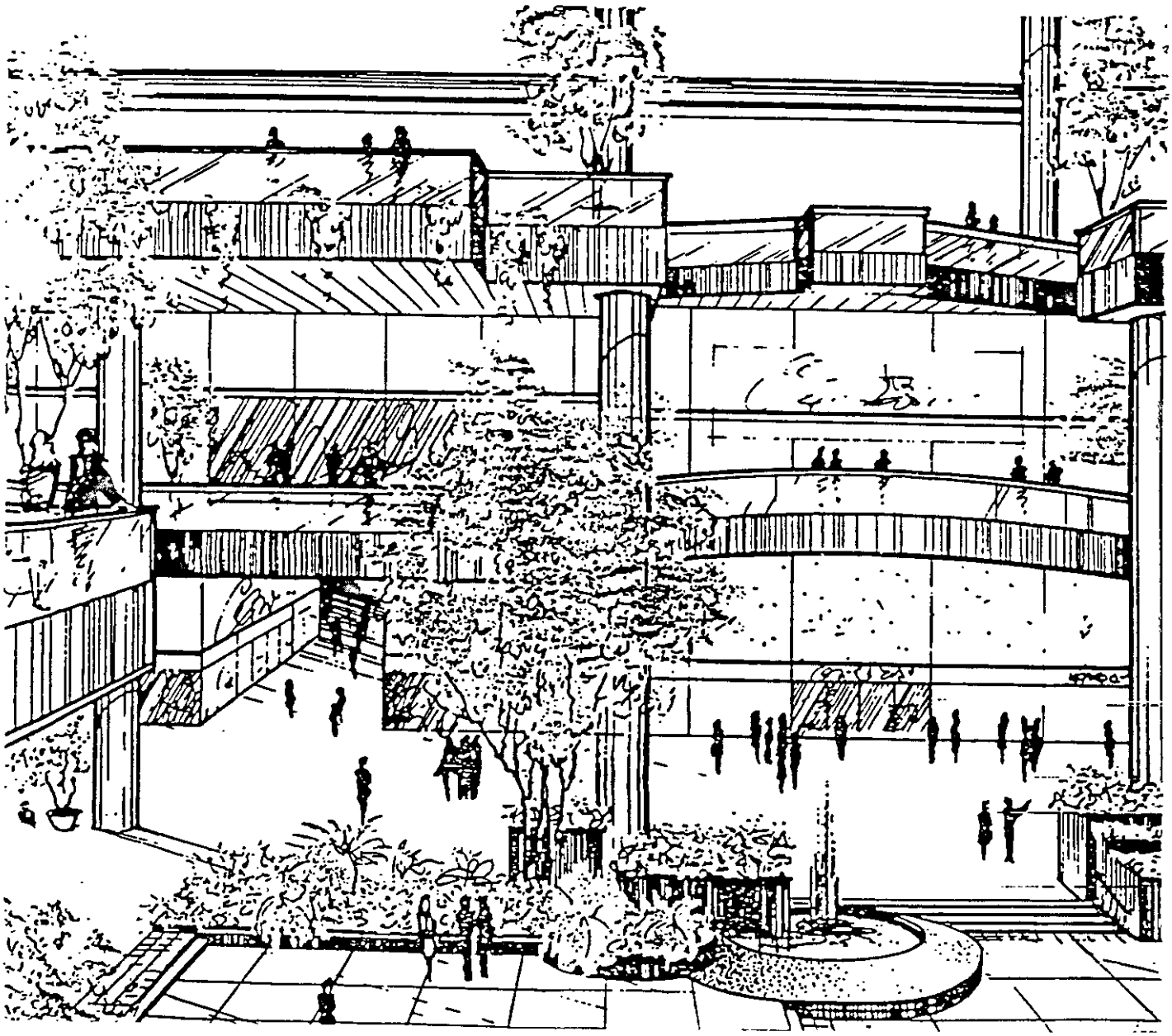
Managing Asbestos In Place

A Building Owner's Guide to Operations and Maintenance Programs for Asbestos-Containing Materials



Managing Asbestos in Place

A Building Owner's Guide to Operations and Maintenance Programs for Asbestos-Containing Materials



Contents

Acknowledgements

The time and effort that many individuals contributed to the development of this document is gratefully acknowledged by the U.S. Environmental Protection Agency (EPA). The material in this publication represents EPA's approximately 11 years of experience in considering public input and fine tuning policies on managing asbestos-containing materials in buildings. This document incorporates views expressed by safety and health professionals, property owners and managers, public officials, general industry representatives, workers, and the general public.

The primary EPA developer and coordinator of the final document was Dr. Robert Jordan of the Technical Assistance Section, Environmental Assistance Division, Office of Toxic Substances. Without Bob's constant oversight, combined with his technical knowledge and concern that the document be representative of state-of-the-art asbestos management, this document would not have reached the public.

Joe Schechter, Chief of the Technical Assistance Section, managed the project and helped clarify and edit the Guide. Bob McNally, Chief of the Assistance Programs Development Branch, was instrumental in the formative period of the Guide's development and also devoted long hours to its review. Other important contributions within the Environmental Assistance Division came from Tom Tillman and Dave Kling. Sylvia Thomas provided necessary assistance in revisions of the early drafts. Esther Tepper and Jane Gurin helped review the Guide in its final revisions, to make sure the document was written in easy-to-understand language.

The original work which provided the foundation for the project was performed under a contract with Battelle Memorial Institute (No. 68-02-4294) by Dr. Dale Keyes and Dr. Jean Chesson, under the direction of Edie Sterrett and Cindy Stroup of the EPA Exposure Evaluation Division. They prepared the first drafts of the document and were instrumental in establishing its final format.

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This publication was refined through a peer review meeting held in October 1988 in Washington, DC, and by a series of comment periods provided through May 1990. The following individuals gave their time and provided comments:

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In addition to these individuals, the EPA acknowledges the contribution of the Policy Dialogue Group on Asbestos in Public and Commercial Buildings, which met several times during 1989-1990. The purpose of this multi-disciplinary group was to identify the problems associated with asbestos in public and commercial buildings and to develop policy recommendations for solving these problems. Many comments raised by the Dialogue Group in the area of asbestos management were incorporated into this document.

Foreword

In February 1988, the Administrator of the Environmental Protection Agency (EPA) recommended to Congress that the Agency work during the next three years to enhance the nation's technical capability in asbestos by helping building owners better select and apply appropriate asbestos control and abatement actions in their buildings. The publication of this guidance document is EPA's most extensive effort to date to carry out that recommendation. In fact, *Managing Asbestos In Place* is the most comprehensive asbestos guide published by EPA since the Agency expanded and updated *Guidance for Controlling Asbestos-Containing Materials in Buildings* (also known as the Purple Book) in June 1985. Based on the insights and recommendations of nationally recognized asbestos experts, this new guide, along with a new operations and maintenance work practices manual expected to be available in 1991, provides "state-of-the-art" instruction to building owners to help them successfully manage asbestos-containing materials in place.

Managing Asbestos in Place does not supplant the 1985 Purple Book as EPA's principal asbestos guidance document. Rather, based on our experience since 1985, it expands and refines the Purple Book's guidance for a special operations and maintenance (O&M) program. In particular, the guide more strongly emphasizes the importance of in-place management. The guide's purpose is two-fold. First, it offers building owners the more detailed and up-to-date instruction they need to carry out a successful O&M program. Second, it informs building owners, lenders, and insurers that a properly conducted O&M program can in many cases be as appropriate an asbestos control strategy as removal. Furthermore, in some cases, an O&M program is *more* appropriate than other asbestos control strategies, including removal.

Emphasizing the importance and effectiveness of a good O&M program is a critical element of EPA's broader effort to put the potential hazard and risk of asbestos exposure in proper perspective. That effort centers around communicating *the following five facts*, which EPA hopes will help calm the unwarranted fears that a number of people seem to have about the mere presence of asbestos in their buildings and discourage the spontaneous decisions by some building owners to remove all asbestos-containing material regardless of its condition.

FACT ONE: Although asbestos *is* hazardous, the risk of asbestos-related disease depends upon exposure to airborne asbestos fibers.

In other words, an individual must breathe asbestos fibers in order to incur any chance of developing an asbestos-related disease. How many fibers a person must breathe to develop disease is uncertain. However, at very low exposure levels, the risk may be negligible or zero.

FACT TWO: Based upon available data, the average airborne asbestos levels in buildings seem to be very low. Accordingly, the health risk to most building occupants also appears to be very low.

A 1987 EPA study found asbestos air levels in a small segment of Federal buildings to be essentially the same as levels outside these buildings. Based on that limited data, most building occupants (i.e., those unlikely to disturb asbestos-containing building materials) appear to face only a very slight risk, if any, of developing an asbestos-related disease.

FACT THREE: Removal is often *not* a building owner's best course of action to reduce asbestos exposure. In fact, an improper removal can create a dangerous situation where none previously existed.

By their nature, asbestos removals tend to elevate the airborne level of asbestos fibers. Unless all safeguards are properly applied, a removal operation can actually increase rather than decrease the risk of asbestos-related disease.

FACT FOUR: EPA *only* requires asbestos removal in order to prevent significant public exposure to airborne asbestos fibers during building demolition or renovation activities.

Asbestos removal before the wrecking ball swings into action is appropriate to protect public health. At other times, EPA believes that asbestos removal projects, unless well-designed and properly performed, can actually increase health risk.

FACT FIVE: EPA does recommend a protective, in-place management program whenever asbestos-containing material is discovered.

As this guide will explain in some detail, in-place management does *not* mean "do nothing." It means having a program to ensure that the day-to-day management of the building is carried out in a manner that minimizes release of asbestos fibers into the air, and ensures that when asbestos fibers are released, either accidentally or intentionally, proper control and cleanup procedures are implemented. As such, it may be all that is necessary to control the release of asbestos fibers, until the asbestos-containing material in a building is scheduled to be disturbed by renovation or demolition activities.

Why Is Asbestos a Problem?

Introduction: Asbestos in Buildings

This U.S. Environmental Protection Agency (EPA) guide is primarily directed to owners and managers of office buildings, shopping centers, apartment buildings, hospitals, and similar facilities which may contain asbestos materials. Managers of industrial plants and other types of structures may need to supplement this information with additional specialized guidance. This document gives building owners, managers, workers, and other key building staff basic information on how to develop and carry out high-quality operations and maintenance programs for managing asbestos in place to safeguard the health of all building occupants. An operations and maintenance (O&M) program can be defined as a formulated plan of training, cleaning, work practices, and surveillance to maintain asbestos-containing materials (ACM) in good condition.

In this document you will find the following information:

- The objectives of an O&M program, and an indication of the scope of O&M activities (Chapter 2);
- Basic steps to take before starting an O&M program, including an initial survey and evaluation of ACM (Chapter 3);
- How to implement and manage the program, including some basic cost considerations (Chapter 3);
- O&M work practices that protect both workers and the general building environment (Chapter 4);
- Recordkeeping suggestions and requirements (a section of Chapter 4);
- Training recommendations and requirements for workers performing O&M activities (Chapter 5); and
- An overview of federal regulations, including those affecting O&M programs (Chapter 6).

In addition, the Appendices provide other useful information, including a glossary of useful terms, and contacts for additional assistance.

How O&M Fits In

There are steps which a building owner can take to prevent asbestos fiber releases or resuspension of already-released fibers, or control fiber releases quickly and safely if they occur. O&M programs are designed to achieve both these goals. This guide's purpose, therefore, is to inform building owners about how to develop, implement and manage effective O&M programs, and to encourage their use.

EPA recommends a pro-active, in-place management program whenever asbestos is discovered. In many buildings, a well-run O&M program may be all that is necessary to control the release of asbestos fibers until the ACM in the building is abated through renovation or demolition activities. Also, an emergency repair to equipment or building services, or an unexpected incident such as ACM falling from a surface could necessitate a different control strategy. However, barring such events, if ACM is properly managed, release of asbestos fibers into the air is minimized. The exposure to asbestos fibers, and therefore the risk of asbestos-related disease, can be reduced to a negligible level for all building occupants.

An O&M program may also provide an effective, less costly alternative to wholesale removal operations. Some additional cost-related considerations are discussed in Chapter 3.

The EPA National Emission Standards for Hazardous

An O&M program can be defined as a formulated plan of training, cleaning, work practices, and surveillance to maintain asbestos-containing materials in good condition.

Air Pollutants (NESHAP) regulations on asbestos may require ACM removal prior to renovation and/or demolition projects, to prevent significant asbestos releases into the air (see Chapter 6). Additionally, removal of some ACM in a building will be necessary if the material has been damaged beyond repair. *However,* at other times, removal is often *not* a building owner's best course of action to reduce asbestos exposure. (Extraneous factors — for example, difficulty in obtaining insurance, or obtaining financing relative to a real estate transaction — may actually represent the driving forces in a decision to remove all ACM, rather than a health-based need for removal.) In fact, unless all safeguards are properly applied by trained, experienced individuals, removing ACM can actually increase building occupants' risk of asbestos-related disease.

Background

The Asbestos Issue

Asbestos fibers can cause serious health problems. If inhaled, they can cause diseases which disrupt the normal functioning of the lungs. Three specific diseases — asbestosis (a fibrous scarring of the lungs), lung cancer, and mesothelioma (a cancer of the lining of the chest or abdominal cavity) — have been linked to asbestos exposure. These diseases do not develop immediately after inhalation of asbestos fibers; it may be 20 years or more before symptoms appear.

In general, as with cigarette smoking and the inhalation of tobacco smoke, the more asbestos fibers a person inhales, the greater the risk of developing an asbestos-related disease. Most of the cases of severe health problems resulting from asbestos exposure have been experienced by workers who held jobs in industries such as shipbuilding, mining, milling, and fabricating, where they were exposed to very high levels of asbestos in the air, without benefit of the worker protections now afforded by law. Many of these same workers were also smokers. These employees worked directly with asbestos materials on a regular basis and, generally, for long periods of time as part of their jobs. Additionally, there is an increasing concern for the health and safety of construction, renovation, and building maintenance personnel, because of possible periodic exposure to elevated levels of asbestos fibers while performing their jobs.

Whenever we discuss the risk posed by asbestos, we must keep in mind that asbestos fibers can be found nearly everywhere in our environment (usually at very low levels). There is, at this time, insufficient information concerning health effects resulting from low-level asbestos exposure, either from exposures in buildings or from our environment. This makes it difficult to accurately assess the magnitude of cancer risk for building occupants, tenants, and building maintenance and custodial workers. Although in general the risk is likely to be negligible for occupants, health concerns remain, particularly for the building's custodial and maintenance workers. Their jobs are likely to bring them into close proximity to ACM, and may sometimes require them to disturb the ACM in the performance of maintenance activities. For these workers in particular, a complete and effective O&M program can greatly reduce asbestos exposure. This kind of O&M program can also minimize asbestos exposures for other building occupants as well.

What is Asbestos?

The term "asbestos" describes six naturally occurring fibrous minerals found in certain types of rock formations. Of that general group, the minerals chrysotile, amosite, and crocidolite have been most commonly used in building products. When mined and processed, asbestos is typically separated into very thin fibers. When these fibers are present in the air, they are normally invisible to the naked eye. Asbestos fibers are commonly mixed during processing with a material which binds them together so that they can be used in many different products. Because these fibers are so small and light, they may remain in the air for many hours if they are released from ACM in a building. When fibers are released into the air they may be inhaled by people in the building.

Asbestos became a popular commercial product because it is strong, won't burn, resists corrosion, and insulates well. In the United States, its commercial use began in the early 1900's and peaked in the period from World War II into the 1970's. Under the Clean Air Act of 1970 the EPA has been regulating many asbestos-containing materials which, by EPA definition, are materials with more than 1 percent asbestos. The Occupational Safety and Health Administration's (OSHA) asbestos construction standard in section K, "Communication of hazards to employees," specifies labeling many materials containing 0.1% or more asbestos. In the mid-1970's several major kinds of asbestos materials, such as spray-applied insulation, fireproofing, and acoustical surfacing material, were banned by EPA because of growing concern about health effects, particularly cancer, associated with exposures to such materials.

In July 1989, EPA promulgated the Asbestos Ban and Phasedown Rule. The rule applies to new product manufacture, importation, and processing, and essentially bans almost all asbestos-containing products in the United States by 1997. This rule does *not* require removal of ACM currently in place in buildings.

Where is Asbestos Likely to be Found in Buildings?

In February 1988, the EPA released a report titled *EPA Study of Asbestos-Containing Materials in Public Buildings: A Report to Congress.* EPA found that "friable" (easily crumbled) ACM can be

found in an estimated 700,000 public and commercial buildings. About 500,000 of those buildings are believed to contain at least some damaged asbestos, and some areas of significantly damaged ACM can be found in over half of them.

According to the EPA study, significantly damaged ACM is found primarily in building areas not generally accessible to the public, such as boiler and machinery rooms, where asbestos exposures generally would be limited to service and maintenance workers. Friable ACM, if present in air plenums, can lead to distribution of the material throughout the building, thereby possibly exposing building occupants. ACM can also be found in other building locations.

Asbestos in buildings has been commonly used for thermal insulation, fireproofing, and in various building materials, such as floor coverings and ceiling tile, cement pipe and sheeting, granular and corrugated paper pipe wrap, and acoustical and decorative treatment for ceilings and walls. Typically, it is found in pipe and boiler insulation and in spray-applied uses such as fireproofing or sound-deadening applications.

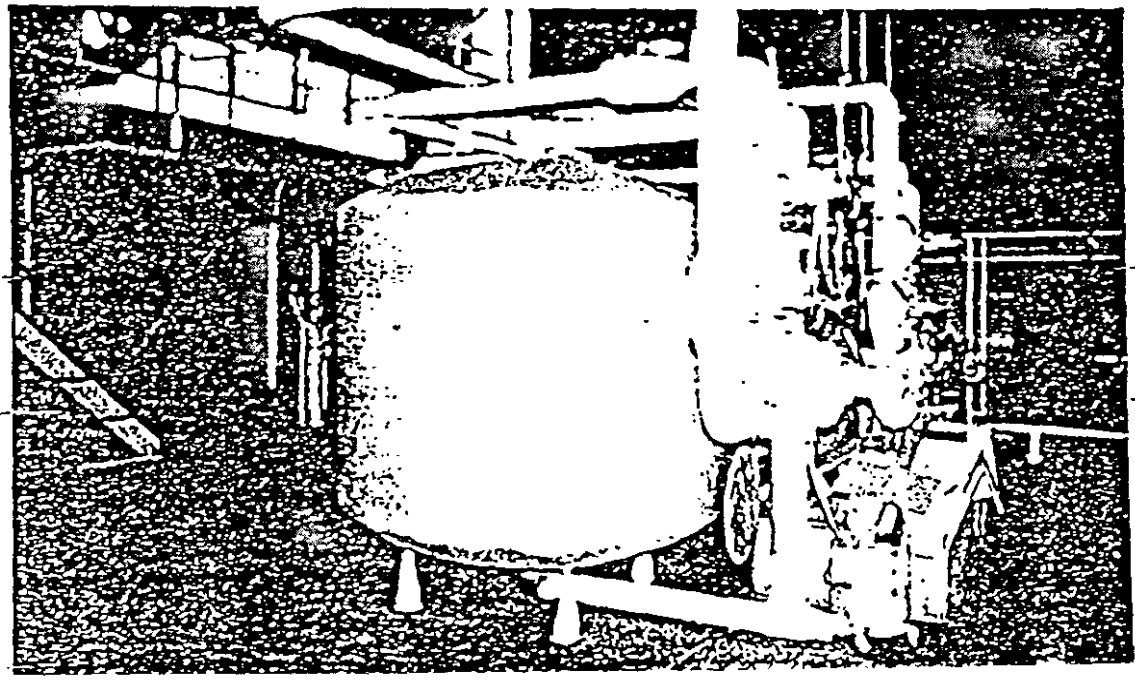
The amount of asbestos in these products varies widely (from approximately 1 percent to nearly 100 percent). The precise amount of asbestos in a product cannot always be accurately determined from labels or by asking the manufacturer. Nor can positive identification of asbestos be ascertained merely by visual examination. Instead, a qualified laboratory must analyze representative samples of the suspect material. Appendix G contains a sample list of some suspect materials.

ACM which is in p physical condition Under a proper op ations and mainte nance program, e rective action wo normally prevent deterioration of th insulation.

When is Asbestos a Problem?

Intact and undisturbed asbestos materials do not pose a health risk. The mere presence of asbestos in a building does not mean that the health of building occupants is endangered. ACM which is in good condition, and is not somehow damaged or disturbed, is not likely to release asbestos fibers into the air. When ACM is properly managed, release of asbestos fibers into the air is prevented or minimized, and the risk of asbestos-related disease can be reduced to a negligible level.

However, asbestos materials can become hazardous when, due to damage, disturbance, or deterioration over time, they release fibers into building air. Under these conditions, when ACM is damaged or disturbed—for example, by maintenance repairs conducted without proper controls — elevated airborne asbestos concentrations can create a potential hazard for workers and other building occupants.



ACM with sound structural integrity on the exterior of a domestic hot wate tank. Note that the insulation jacketin is intact and there is no evidence of disturbance.

Chapter Summary

This document, directed to owners and managers of office buildings and similar facilities, should help lay the groundwork for developing and implementing effective operations and maintenance programs. Major highlights in this section have focused on background information concerning asbestos and have touched on the current asbestos-in-buildings situation. Important points to remember are the following:

- Inhalation of asbestos fibers has been shown to cause asbestosis, lung cancer and mesothelioma. Much of our knowledge of these health effects has come primarily from studies of workers exposed routinely to very high levels of asbestos in their jobs.
- Information on health effects of low-level asbestos exposure is less certain; custodial/maintenance workers who sometimes disturb asbestos as part of their job would benefit from properly executed O&M programs.
- Three of the six naturally occurring asbestos minerals, chrysotile, amosite, and crocidolite, have been most commonly used in building products.
- Asbestos became a popular commercial product because of its strength, heat resistance, corrosion resistance, and thermal insulation properties.
- Asbestos-containing materials (ACM) are regulated by EPA, OSHA, and the Consumer Product Safety Commission (CPSC), and individual state and local agencies.
- Friable ACM can be found in about 700,000 public and commercial buildings. Many areas where asbestos is found are not accessible to the general public.
- Some common uses of asbestos have included pipe/boiler insulation, spray-applied fireproofing, floor and ceiling tile, cement pipe/sheeting and paper pipe wrap.
- Positive identification of asbestos requires laboratory analysis; information on labels or visual examination only is not sufficient.
- Intact, undisturbed materials generally do not pose a health risk; they may become hazardous when damaged, disturbed, or deteriorated over time and release fibers into building air.

What Is an O&M Program?

Purpose and Scope of an Operations and Maintenance Program

Purpose of O&M

The principal objective of an O&M program is to minimize exposure of all building occupants to asbestos fibers. To accomplish this objective, an O&M program includes work practices to (1) maintain ACM in good condition, (2) ensure proper cleanup of asbestos fibers previously released, (3) prevent further release of asbestos fibers, and (4) monitor the condition of ACM.

Scope of an O&M Program

An effective O&M program should address all types of ACM present in a building. ACM that may be managed as part of an O&M program in buildings can be classified in one of the following categories:

1. **Surfacing Material:** Examples include ACM sprayed or troweled onto surfaces, such as decorative plaster on ceilings or acoustical ACM on the underside of concrete slabs or decking, or fireproofing materials on structural members.
2. **Thermal System Insulation (TSI):** Examples include ACM applied to pipes, boilers, tanks, and ducts to prevent heat loss or gain, or condensation.
3. **Miscellaneous ACM:** Examples include asbestos-containing ceiling or floor tiles, textiles, and other components such as asbestos-cement panels, asbestos siding and roofing materials.

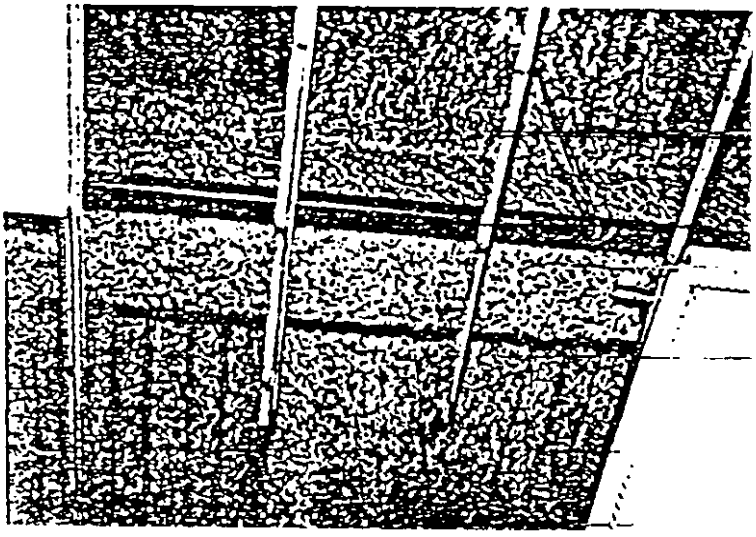
The O&M program, when developed and implemented in a particular facility, should include specific direction on how to deal with each of these general categories of ACM. Specified O&M work practices and procedures should be employed by trained personnel during building cleaning, maintenance, renovation, and general operational activities that may involve surfacing, thermal, or miscellaneous ACM. Some elaboration of O&M work practices and procedures is found in Chapter 4.

The O&M program can be divided into three types of projects:

- those which are unlikely to involve any direct contact with ACM;
- those which may cause accidental disturbance of ACM;
- those which involve relatively small disturbances of ACM.

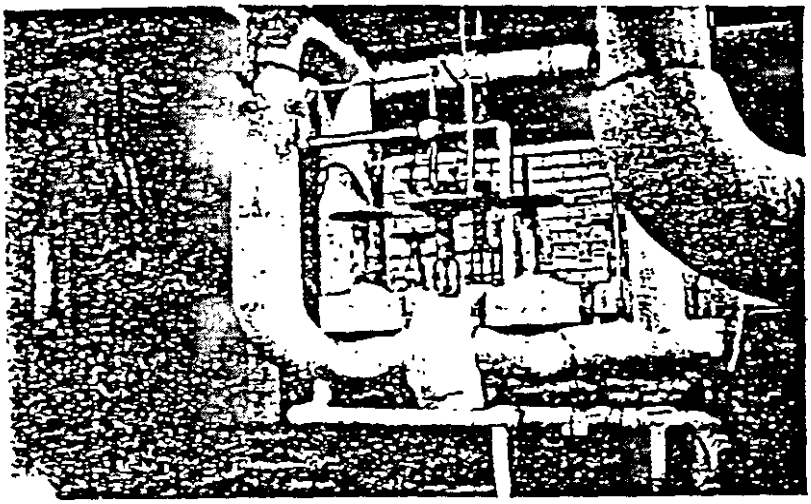
The first type may involve routine cleaning of shelves and counter tops or other surfaces in a building (provided ACM debris is not present). Generally, such

An example of spra applied surfacing ACM on a metal de above a suspende ceiling.



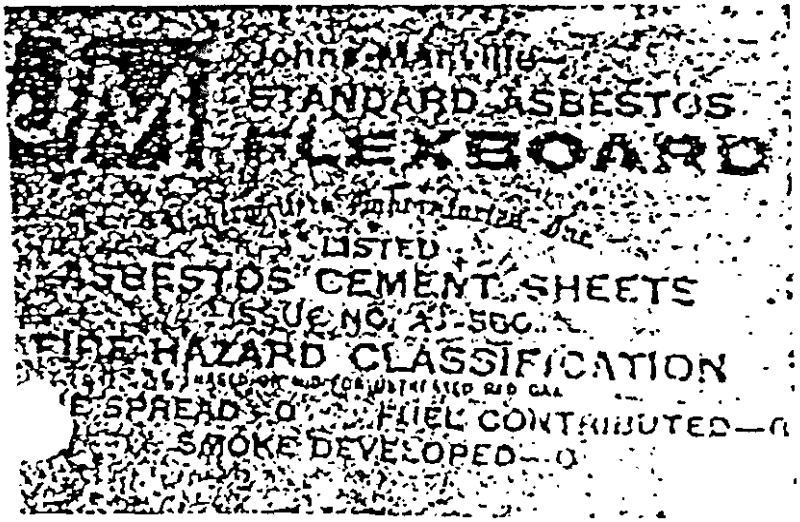
activities would not be expected to disturb ACM. The second type of project could include maintenance work above a suspended ceiling in an area that may have surfacing ACM overhead. The third type of project — small-scale, short-duration maintenance, repair, or installation projects involving minor disturbances of ACM — includes activities such as installation of new light fixtures on or in an ACM ceiling. A single glovebag operation to remove a small amount of ACM to repair a pipe in a boiler room is another example of intentional small-scale, short-duration disturbance.

An example of asbestos-containing thermal system insulation on pipes in a building's mechanical room.



Larger projects involving more complex procedures for the intentional removal of ACM are considered asbestos abatement projects. These require asbestos control and abatement procedures that are outside the scope of an O&M program. Before taking action, building owners should consult qualified professionals for advice and alternative solutions. Guidance for building owners on the management of abatement projects is included in EPA's "Guidance for Controlling Asbestos-Containing Materials in Buildings," June 1985, also known as the "Purple Book."

An example of an asbestos-containing cement sheet product (miscellaneous ACM).



Chapter Summary

The purpose of an Operations and Maintenance Program is to minimize exposure of all building occupants to asbestos fibers. Through supervised work practices, ACM can be managed in place. Important points to remember are:

ACM can be classified into three categories:

- Surfacing Material
- Thermal System Insulation (TSI)
- Miscellaneous Material

O&M Programs can be divided into three types of projects:

- Unlikely to involve direct contact with ACM.
- Accidental disturbance of ACM.
- Small-scale, short-duration maintenance or repair activity, which may involve intentional disturbance of ACM.

How Does the Program Start?

Laying the Foundation for an Effective O&M Program

A comprehensive asbestos control program for a building should include these basic steps:

- Appoint an Asbestos Program Manager and develop an organizational policy.
- Conduct a physical and visual inspection of the building and take bulk samples of suspect materials to determine if ACM is present, establish an ACM inventory, and assess the ACM's condition and potential for disturbance.
- If ACM is located, develop an O&M program, based on the inspection and assessment data.
- Implement and manage the O&M program conscientiously.
- Select and implement abatement actions other than O&M when necessary.

This chapter provides information about each of these basic steps. In addition, see Appendix F for a chart of references outlining existing EPA guidance for each of these steps.

The Asbestos Program Manager

The position of Asbestos Program Manager (APM) is frequently held by the building engineer, superintendent, facilities manager, or safety and health director. In a small organization, the building owner may have this role. Regardless of who holds this position, EPA stresses the need for the Asbestos Program Manager to be properly qualified, through training and experience, and to be *actively involved* in all asbestos-control activities. EPA accreditation under the Asbestos Hazard Emergency Response Act (AHERA) or state certification as a Building Inspector/Management Planner would be typical of the requisite training.

If the person selected is not adequately prepared, he or she should receive the training necessary to develop and manage an asbestos control program prior to beginning the job. If for some reason this is not possible, the building owner should strongly consider hiring a properly trained, experienced, and credentialed outside consultant or firm to provide direction to the owner or the Asbestos Program Manager.

In general, the Asbestos Program Manager should have the authority to oversee all asbestos-related activities in the building, including inspections, O&M activities, and other abatement actions. The Asbestos Program Manager will either train building workers in O&M techniques or ensure that such worker training takes place. In addition, he or she should oversee the custodial and maintenance staffs, contractors, and outside service vendors with regard to all asbestos-related activities.

Building Inspection and Assessment

To determine whether an asbestos control and management program should be implemented, the owner should have an initial building inspection performed to locate and assess the condition of all ACM in the building. A trained, experienced and qualified inspector, who is able to perform the sampling of suspect ACM for laboratory analysis, should conduct the inspection. If an inspection is not performed, then certain suspect materials should be assumed to contain asbestos, and treated accordingly. (Refer to Appendix G for a sample list of suspect ACM.)

EPA guidance on how to take "bulk" samples of suspect ACM is contained in several publications (see Appendix H) and from EPA Regional Asbestos Coordinators (listed in Appendix D).

The building inspection by a qualified professional serves as the basis for establishing an effective overall plan for dealing with the asbestos in the building. The inspector should advise the owner and the Asbestos

To determine whether an asbestos control and management program should be implemented, the owner should have an initial building inspection performed to locate and assess the condition of all ACM in the building.

A properly trained and protected building inspector collecting a bulk sample of suspected asbestos-containing thermal system insulation.

Program Manager of inspection findings. Of course, the inspection may show that ACM is *not* present and that an asbestos-control program is not required.

If ACM *is* found, the material's characteristics, condition, quantity, and location within the building, as well as building use, will affect how the building owner should deal with the ACM. For example, operations and maintenance procedures may be appropriate and sufficient in a particular building for ACM in good condition. But O&M procedures alone are not sufficient for ACM that the inspector determines is significantly damaged, and may not be sufficient for some types of ACM situated in highly accessible areas; in these instances, some form of full scale abatement — repair, encapsulation, enclosure, encasement, or removal — will be necessary. Removal of the ACM may also be appropriate when performed in conjunction with major building renovations, or as part of long-term building management policies (such as staged removal in conjunction with renovation over the life of the building, as covered by the EPA NESHAP requirements for removal before demolition or renovation).

Developing an O&M Program

If ACM is found, the building owner should have an O&M program developed as soon as possible. Either the Asbestos Program Manager or a qualified consultant should develop the O&M program. The written O&M program should state clearly the O&M policies and procedures for that building, identify and describe the administrative line of authority for that building, and should clearly define the responsibilities of key participants, such as the Asbestos Program Manager and custodial and maintenance supervisors and staff. The written O&M program should be available and understood by all participants involved in the management and operations of the building.

In general, the O&M program developed for a particular building should include the O&M program elements discussed in the next chapter. However, the building owner should make sure that the O&M program developed is site-specific and tailored for the building. The O&M program should take into account use, function, and design characteristics of a particular building.

Implementing and Managing an O&M Program

A well-developed O&M program is ineffective unless the building owner is committed to implementing it properly. The building owner should convey this commitment to key personnel involved in a building's management and operations — particularly the Asbestos Program Manager and custodial and maintenance supervisors and staff. The O&M program's success is contingent upon key personnel understanding the O&M program and committing themselves to implementing it effectively.

To the greatest extent possible, the building owner should incorporate the O&M program into the existing system for managing a building's operations. Each building owner, therefore, will determine the appropriate organizational structure on a case-by-case basis. Two possible arrangements are suggested in Figures 1 and 2 in Appendix C.

When managing an O&M program, the Asbestos Program Manager should oversee all asbestos-related activities. In instances where a building owner hires a contractor to perform custodial and maintenance work, the Asbestos Program Manager should ensure that the contractor is qualified to conduct work that may involve ACM. Before hiring a contractor, the Asbestos Program Manager should investigate to determine whether the contractor's staff is qualified, trained and equipped to deal with O&M asbestos activities. Thoroughly checking the references of a contractor is a good recommended practice.

The Asbestos Program Manager should also monitor the work performed in the building by other contractors, such as electricians and plumbers, who might inadvertently disturb ACM. Instituting a work permit system, as discussed in the next chapter, may prevent accidental disturbances of ACM. Under this system, a

contractor must receive a work permit from the Asbestos Program Manager before commencing work. At that time, the Asbestos Program Manager will inform the contractor whether the project could disturb ACM and provide any special instructions to make sure the work is done properly. *Communication between the Asbestos Program Manager and tenants occupying the building is essential to prevent activities that might compromise the O&M program.*

In addition, the Asbestos Program Manager should routinely and frequently check the work being performed in the building by contractors and custodial and maintenance staff to see if their work is disturbing ACM. By maintaining close surveillance over these activities, the Asbestos Program Manager can help ensure that work which may disturb ACM is being done safely. Tenants should be required (by legal agreement or understanding) to notify the building owner or the Asbestos Program Manager before conducting even small planned renovations. This would help prevent building tenants from unknowingly disturbing ACM. For both the work permit system and the renovation notification requirement, clear and effective communications to workers and tenants are crucial to the success of the O&M management program.

The Asbestos Program Manager should periodically review the written O&M plan to determine whether it should be updated. For example, if all ACM were removed from some areas of the building during a recent renovation, or if some ACM was damaged, the O&M program should be revised accordingly. The O&M program should remain in effect as long as there is ACM present in the building.

Cost Considerations

The costs associated with implementing and managing an O&M program may vary significantly depending on the types of ACM, building-specific factors, actual O&M procedures adopted, types of equipment used, and the useful life of the building. Owners may find it more cost-effective to continue a well-supervised and managed O&M program than to incur the costs of immediate, large-scale removal. In addition to the direct costs of removal, other costs related to ACM removal include moving building occupants, arranging alternative space for building occupants during the removal work, and restoring the building after the removal is completed.

Clearly, many factors enter into the decision. Only by conducting a cost-effectiveness analysis of the long-term options (e.g., comparing (a) immediate removal with (b) phased removal plus O&M with (c) removal just before demolition plus lifetime O&M) will owners be truly able to determine which option is most cost-effective for their buildings. The prudent owner may need to consult one or more qualified consultants or firms for advice, if such expertise does not exist within the owner's organization.

Selecting and Implementing Alternative Abatement Actions

In some instances, due to the condition of ACM or upcoming building renovations, a building owner may decide to take other abatement actions to deal with ACM in the building. These response actions could include encapsulation (covering the ACM with a sealant to prevent fiber release), enclosure (placing an air-tight barrier around the ACM), encasement (covering the ACM with a hard-setting sealing material), repair, or removal of the ACM. Qualified, trained, and experienced contractors should be used for any of these actions. EPA's Purple Book discusses most of these alternatives in some detail. In general, repair, encapsulation, enclosure, and encasement, are intended to help prevent the release of asbestos fibers. As aspects of O&M, these techniques manage ACM in place. See Appendix F of this document for additional federal reference sources on asbestos response actions.

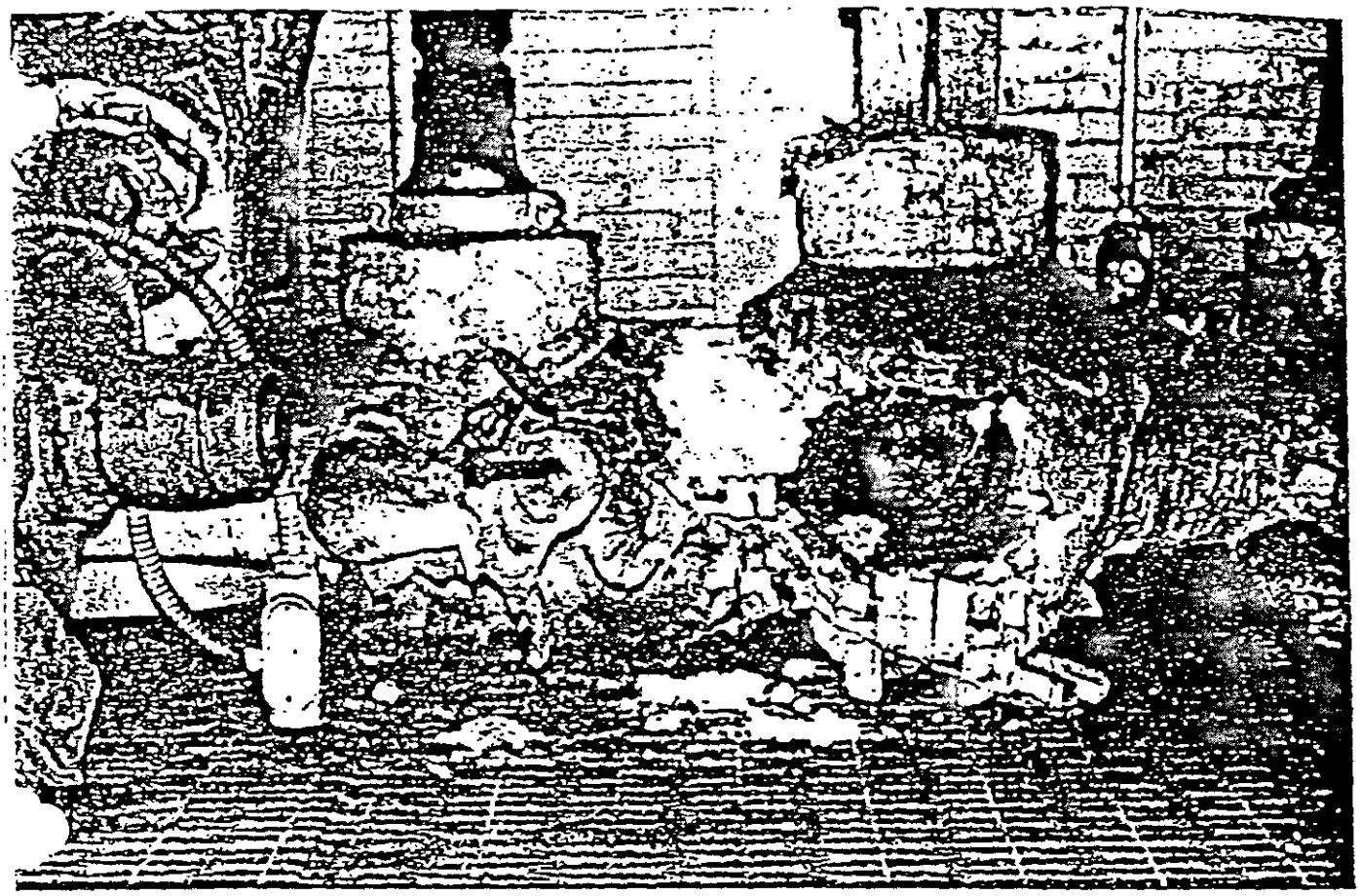
When determining which response alternative to select, the building owner and Asbestos Program Manager may consider seeking advice from qualified, independent consultants with specific training and experience in asbestos management.

Asbestos consultants should have a background in engineering, architecture, industrial hygiene, safety, or a similar field. Experts who are Registered and/or with Board Certified backgrounds are recommended. *To help ensure that no "conflict of interest" exists, consultants should not be affiliated with the abatement contractors who may be used on a recommended ACM control project, nor with analytical laboratories which perform sample analyses.* As with other similar business decisions, building owners should interview several consultants and check references.

Renovations (including remodeling or redecorating) of buildings or replacement of utility systems increase the potential for disturbing ACM. Before conducting any renovation or remodeling work, the building owner should have the Asbestos Program Manager review asbestos inspection and assessment records to determine where ACM may be located, visually reinspect the area, and evaluate the likelihood that ACM will be disturbed. Any suspect or assumed ACM that could be disturbed during the renovation work should either be sampled and analyzed to determine whether it contains asbestos, or the work should be carried out as if the materials did contain asbestos. The Asbestos Program Manager should also ensure that no new ACM is introduced into the building as part of the renovation work.

Renovations (including remodeling or redecorating) of buildings or replacement of utility systems increase the potential for disturbing ACM.

Removal of the ACM before renovation begins may be necessary in some instances. Removal is required by the Asbestos NESHAP regulations for projects which would break up more than a specified minimum amount of ACM; specifically, at least 160 square feet of surfacing



Asbestos-containing thermal system insulation which has sustained significant damage in a mechanical/boiler room of a building.

or miscellaneous material or at least 260 linear feet of thermal system insulation (40 CFR 61.145–147). Building owners and managers are encouraged to contact their state or local health or environmental department for further clarification of these requirements (also, see Chapter 6 of this document). It is important to ensure that new materials placed in the building do not contain asbestos in order to comply with the recent EPA Asbestos Ban and Phase Out rule (see Chapter 6).

In general, building owners should thoroughly consider any decision to remove ACM. *O&M, encapsulation, encasement, enclosure, or repair may be viable alternatives to removal.* Building owners should assess these in-place management techniques carefully before deciding to remove undamaged ACM.

Under certain circumstances, however, such as when some ACM must be removed during building renovations, when the ACM has sustained a great deal of damage, or ACM disturbance will be difficult to manage properly, the building owner may decide to remove ACM in parts of the building.

When removal must occur, only qualified, trained and experienced project designers and contractors should be permitted to design and perform the work. Building owners might consider contacting local, state, and federal asbestos regulatory agencies to see if prospective contractors have received citations for violating asbestos regulations in the past. In addition, if the building owner and Asbestos Program Manager are not properly qualified themselves, they should retain a qualified and independent project designer and a project monitor with training and experience in asbestos abatement to oversee and ensure that the asbestos abatement work is done safely. When these precautions are taken, asbestos removal is more likely to proceed safely and effectively.

Proper completion of the ACM removal is best evaluated by means of the analytical procedures using transmission electron microscopy (TEM). (These are described in 40 CFR Part 763, Appendix A to Subpart E.) Clearance protocols for statistically comparing asbestos fiber levels inside the work area with outside levels are available. If the measured levels inside are not statistically higher than the average airborne asbestos concentration measured outside the abatement area, the cleanup is considered successful, and the space is judged ready for reoccupancy. (For reference, see Appendix H, U.S. EPA "Guidelines for Conducting the AHERA TEM Clearance Test ....")

Chapter Summary

Laying the foundation for a comprehensive asbestos control program for a building includes some basic steps. Important points contained in this discussion are the following:

- An Asbestos Program Manager needs to be properly qualified through training and experience, and be actively involved in all asbestos control and disturbance activities.
- An Asbestos Program Manager should have authority to oversee and to direct custodial/maintenance staff and contractors with regard to all asbestos-related activities.
- An initial building inspection should be performed by a trained, qualified, experienced inspector to locate and assess the condition of all ACM in the building.
- The inspection results serve as the basis for establishing an O&M program. O&M procedures may not be sufficient for certain ACM that is significantly damaged or in highly accessible areas.
- An Asbestos Program Manager or qualified consultant should develop the written O&M program that is site-specific and tailored for individual buildings. The O&M program should take into account use, function and design characteristics of a building.
- The success of any O&M program lies in the commitment by the building owner to implement it properly.
- When outside contractors are used for asbestos-related activities, their references and training should be thoroughly checked and their subsequent work monitored.
- Periodically review written O&M programs.
- Alternatives or control options that may be implemented under an O&M program include:
  - repair
  - encapsulation
  - enclosure
  - encasement
  - removal (minor)
- Removal of ACM before renovations may be necessary in some instances. (See NESHAP and State/Local regulations discussion in Chapter 6.)

The success of any O&M program depends on the building owner's commitment to implement it properly.

What Does an O&M Program Include?

O&M Program Elements

To achieve its objectives, an O&M program should include seven elements. Although these should appear in any O&M program, the extent of each will vary from program to program depending on the building type, the type of ACM present, and the ACM's location and physical condition. For example, if only nonfriable ACM is present, minimal notification might be needed, and custodial or maintenance staff would most likely have fewer work practices to be followed. If friable ACM is present, a more detailed O&M program should be prepared and followed. Each of the first six elements listed below is described in this chapter to provide an illustration of a basic O&M program. The seventh program element, training of the Asbestos Program Manager and custodial and maintenance staff, is very important. If staff are not adequately trained, the O&M program will not be effective. Chapter 5 is devoted exclusively to O&M training topics.

A successful O&M program should include the following elements:

- **Notification:** A program to tell workers, tenants, and building occupants where ACM is located, and how and why to avoid disturbing the ACM. All persons affected should be properly informed.
- **Surveillance:** Regular ACM surveillance to note, assess, and document any changes in the ACM's condition.
- **Controls:** Work control/permit system to control activities which might disturb ACM.
- **Work Practices:** O&M work practices to avoid or minimize fiber release during activities affecting ACM.
- **Recordkeeping:** To document O&M activities.
- **Worker Protection:** Medical and respiratory protection programs, as applicable.
- **Training:** Asbestos Program Manager, and custodial and maintenance staff training.

If staff are not adequately trained, the O&M program will not be effective.

Informing Building Workers, Tenants, and Other Occupants

Building owners should inform building workers, occupants, and tenants about the location and physical condition of the ACM that they might disturb, and stress the need to avoid disturbing the material. Occupants should be notified for two reasons: (1) building occupants should be informed of any potential hazard in their vicinity; and (2) informed persons are less likely to unknowingly disturb the material and cause fibers to be released into the air.

Building owners can inform occupants about the presence of ACM by distributing written notices, posting signs or labels in a central location where affected occupants can see them, and holding awareness or information sessions. The methods used may depend on the type and location of the ACM, and on the number of people affected. Some states and localities have "right-to-know" laws which may require that all occupants, workers, and visitors in buildings with ACM be informed that asbestos is present.

In service and maintenance areas (such as boiler rooms), signs such as "Caution — Asbestos — Do Not Disturb" placed directly adjacent to thermal system insulation ACM will alert and remind maintenance

workers not to inadvertently disturb the ACM. In most cases, all boilers, pipes, and other equipment with ACM in service areas where damage may occur should have prominent warning signs placed next to the ACM. As an alternative, color coding can be used to identify the ACM in certain situations provided that all potentially involved parties understand the coding system.

Information sessions reinforce and clarify written notices and signs, and provide an opportunity to answer questions. All employees and tenants or tenant representatives likely to disturb ACM should be included in the notification program on a continuing basis. Building owners should inform new employees about the presence of ACM before they begin work. Owners should provide additional signs and information sessions in languages other than English where a significant number of workers, occupants, or visitors do not speak English. It may be necessary to make special provisions for illiterate workers, such as providing clear verbal information or signs, about potential hazards of disturbing ACM and showing them where ACM is located.

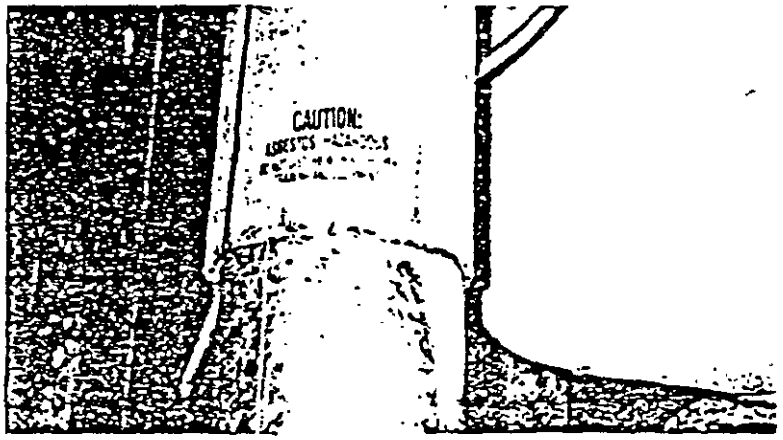
The specific information given to types of building occupants will vary. For example, since service workers carry out certain tasks that office workers or tenants do not perform, they should receive additional information. Most important, O&M workers should receive the training necessary for them to perform their tasks safely.

Whatever its form, the information given to building occupants and workers should contain the following points to the extent they reflect building conditions:

- ○ ACM has been found in the building and is located in areas where the material could be disturbed.
- ○ The condition of the ACM, and the response which is appropriate for that condition.
- ○ Asbestos only presents a health hazard when fibers become airborne and are inhaled. The mere presence of ACM does not represent a health hazard.
- ○ The ACM is found in the following locations (e.g., ceilings in Rooms 101 and G-323, walls in the lobby, above suspended ceilings in the first floor corridor, on columns in the main entry, on pipes in the boiler room).
- ○ Do not disturb the ACM (e.g., do not push furniture against the ACM, do not damage TSI).
- ○ Report any evidence of disturbance or damage of ACM to (name, location, and phone number of Asbestos Program Manager).

Routine maintenance activities can cause disturbance of ACM i workers are not prop erly trained in operations and maintenance procedures. Here, a worker carelessly contacts ACM, possibly damaging it

- ○ Report any dust or debris that might come from the ACM or suspect ACM, any change in the condition of the ACM, or any improper action (relative to ACM) of building personnel to (name, location, and phone number of Asbestos Program Manager).
- ○ Cleaning and maintenance personnel are taking special precautions during their work to properly clean up any asbestos debris and to guard against disturbing ACM.
- ○ All ACM is inspected periodically and additional measures will be taken if needed to protect the health of building occupants.



An example of an asbestos caution sig placed directly on a section of asbestos-containing duct insulation. Signs such as this help to ensure that workers will not inadvertently disturb ACM.

It is important to undertake an honest and open approach to the ACM notification procedure. Owners should strive to establish clear lines of communication with all building occupants regarding asbestos issues. People who are informed of the presence, location and condition of ACM in a building where they work or live, who understand that the mere presence of ACM is not necessarily hazardous to them, and who accept that ACM can often be managed effectively in place, can be

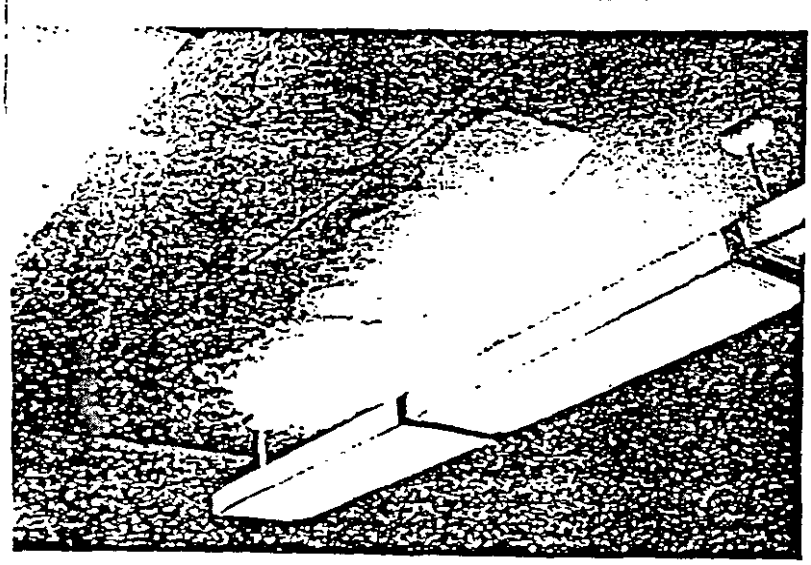
very helpful to the owner in eliminating or reducing hysteria on the part of other less informed building occupants. On the other hand, if occupants suspect the building owner is not being honest about asbestos activities in the building, that owner's credibility may be questioned and the situation can become far more difficult to manage. *If and when asbestos incidents occur, it is especially important for the building owner to deal with occupants and contractors openly and honestly, for that is the best way to maintain occupant/tenant confidence in both the owner and the building's asbestos program.*

ACM Surveillance

Visual reinspections of asbestos materials at regular intervals can detect changes in material condition. Here, surfacing ACM has delaminated from a ceiling in a building; O&M routines can keep small problems from becoming big problems.

Reinspection and Periodic Surveillance

A visual reinspection of all ACM should be conducted at regular intervals as part of the O&M program. Combined with ongoing reports of changes in the condition of the ACM made by service workers, the reinspections should help ensure that any ACM damage or deterioration will be detected and corrective action taken.



According to recent EPA regulations covering schools (the Asbestos Hazard Emergency Response Act, "AHERA"), an accredited inspector must reinspect school buildings at least once every three years to reassess the condition of ACM. The AHERA regulations for schools also require a routine surveillance check of ACM every six months to monitor the ACM's condition. The AHERA *Rule* permits this surveillance to be conducted by a trained school custodian or maintenance worker. While these intervals are mentioned here as a guide, they may also be appropriate for other buildings. The Asbestos Program Manager should establish appropriate intervals, based on consultation with the building owner and any other qualified professionals involved in the O&M program.

EPA recommends a visual and physical evaluation of ACM during the reinspections to note the ACM's current condition and physical characteristics. Through this reinspection, it is possible to determine both the relative degree of damage and assess the likelihood of future fiber release. Maintenance of a set of visual records (photos or video tape) of the ACM over time can be of great value during reinspections.

Some asbestos consultants recommend examining settled dust for accumulations of asbestos fibers as another surveillance tool in an O&M program. While no universally accepted standardized protocols currently exist for sampling and analysis of settled dust, positive results (i.e., ACM is present in the dust) may indicate the need for special cleaning of the affected area, or other action. Because the results of this testing are difficult to interpret and evaluate at this time, building owners should carefully consider the appropriateness of this testing to their situation.

Supplement to Visual/Physical Evaluation

As part of an O&M program, a carefully designed air monitoring program to detect airborne asbestos fibers in the building may provide useful supplemental information when conducted along with a comprehensive visual and physical ACM inspection and reinspection program. If the ACM is currently in good condition, increases in airborne asbestos fiber levels at some later time may provide an early warning of deterioration or disturbance of the material. In that way, supplemental air monitoring can be a useful management tool. If an owner chooses to use air monitoring in an "early warning" context, a knowledgeable and experienced individual should be consulted to design a proper sampling strategy. Appendix H contains a reference to a useful guide to monitoring airborne asbestos, which can be consulted for further discussion of this subject.

If supplemental air monitoring is done, a baseline airborne asbestos fiber level should be established soon after the O&M program is initiated. Representative, multiple air samples should be collected throughout the building during periods of normal building operation. This should be done over a long enough period of time to be representative of existing conditions, in order to adequately characterize prevailing fiber levels in the building. *This air monitoring should supplement, not replace, physical and visual inspection.* Visual inspection can recognize situations and anticipate future exposure (e.g., worsening water damage), whereas air monitoring can only detect a problem after it has occurred, and fibers have been released.

Note that the collection of air samples for supplementary evaluation *should not* use aggressive air sampling methods. Aggressive sampling methods, in which air is deliberately disturbed or agitated by use of a leaf blower or fans, should be used at the completion of an asbestos removal project when the building or area is unoc-

copied, not for routine monitoring.

The most accurate and preferred method of analysis of air samples collected under an O&M program would require the use of transmission electron microscopy (TEM). Phase contrast microscopy (PCM), which is commonly used for personal air sample analysis and as a screening tool for area air monitoring, cannot distinguish between asbestos fibers and other kinds of fibers which may be present in the air. PCM analysis also cannot detect thin asbestos fibers, and does not count short fibers. TEM analysis is approximately ten times more expensive than PCM analysis. However, the more accurate information on actual levels of airborne asbestos fibers should be more beneficial to the building owner who elects to use supplemental air monitoring in the asbestos management program. TEM analysis is most reliably performed by laboratories accredited by the National Institute for Standards and Technology (NIST; see Appendix D for telephone number), and who follow EPA's quality assurance guidelines. (Appendix H, U.S. EPA. Dec. 1989. "Transmission Electron Microscopy Asbestos Laboratories: Quality Assurance Guidelines.")

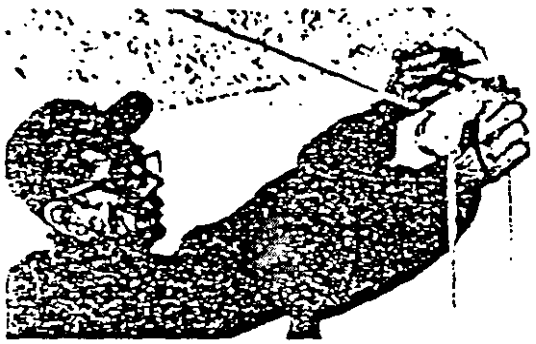
Selection of a reliable and experienced air monitoring firm and analytical laboratory is important, if the building owner elects to conduct supplemental air monitoring under the O&M program. A consultant knowledgeable in air sampling and analysis protocols can be contacted for recommendations if the building owner or Asbestos Program Manager has limited knowledge in this area.

Periodic air monitoring, conducted simultaneously with the visual reinspections or surveillance, would then be used to see if asbestos levels have changed relative to the baseline. Some building owners may wish to present current air monitoring results to building occupants in addition to information regarding the physical reinspections. Although this supplemental use of air monitoring as part of an O&M program may provide useful information, it is likely to be very expensive, particularly if the more accurate and recommended TEM analysis is used. Use of only a small number of measurements or measurements taken only at one time may be misleading (i.e., overestimate or underestimate of fiber levels), and can lead to inappropriate decisions.

It should be noted that some of the exposures of persons to airborne asbestos fibers in buildings may result from episodic events, such as repair work or the accidental disturbance of the ACM or of ACM debris by maintenance activities inside the building. Air monitoring may not be done frequently enough to include such episodic events; this can lead to a misleading interpretation of air sampling results. In particular, air sampling may underestimate the exposure of O&M workers and building occupants. A good reference sourcebook for additional information on air sampling and analysis for asbestos fibers is "A Guide to Monitoring Airborne Asbestos in Buildings" (see Appendix H).

Work Control/Permit System

The O&M program should include a system to control all work that could disturb ACM. Some building owners have had success using a "work permit" program, which requires the person requesting the work to submit a Job Request Form to the Asbestos Program Manager (Appendix B, Form 2) before any maintenance work is begun. The form gives the time and location of the requested work, the type of maintenance needed, and available information about any ACM in the vicinity of the requested work. The contractor or other person authorized to perform the work should be identified on the work request.



An example of a maintenance worker conducting activities near a friable asbestos-containing ceiling. Under a proper permitting system, the building Asbestos Program Manager would evaluate and authorize projects such as this prior to beginning work.

Upon receiving a pre-work Job Request Form, the Asbestos Program Manager should take the following steps:

1. Refer to written records, building plans and specifications, and any building ACM inspection reports to determine whether ACM is present in the area where work will occur. If ACM is present, but it is not anticipated that the material will be disturbed, the Asbestos Program Manager should note the presence of the ACM on the permit form and provide additional instruction on the importance of not disturbing the ACM.

2. If ACM is both present and likely to be disturbed, the Asbestos Program Manager or a designated supervisor qualified by training or experience, should visit the site and determine what work practices should be instituted to minimize the release of asbestos fibers during the maintenance activity.

3. This determination should be recorded on the Maintenance Work Authorization Form (see example in Appendix B, Form 3), which is then sent to the in-house maintenance supervisor or to the maintenance contractor to authorize the work.

4. The Asbestos Program Manager should make sure that a copy of both the request and the authorization forms (if granted) are placed in the permanent file.

5. Where the task is not covered by previously approved standard work practices, the Asbestos Program Manager should make sure that the appropriate work practices and protective measures are used for the job.

6. For all jobs where contact with ACM is likely, the Asbestos Program Manager or a designated supervisor qualified by training or experience should visit the work site when the work begins to see that the job is being performed properly. For lengthy jobs where disturbance of ACM is intended or likely, periodic inspections should be made for the duration of the project.

7. The Asbestos Program Manager's observations should be provided on an *Evaluation of Work Form* (see Appendix B, Form 4). Any deviation from standard and approved work practices should be recorded immediately on this form and the practices should be immediately corrected *and reported to the Asbestos Program Manager.*

8. Upon completion of the work, a copy of the evaluation form should be placed in the permanent asbestos file for the building.

Building owners should consider using asbestos O&M work control forms similar to those which already may be in use for non-ACM work in their facilities, or expanding the existing forms to include the content of the request, approval, and evaluation forms illustrated in Appendix B.

It is important to undertake an honest and open approach in ACM notification.

The O&M management system should also address work conducted by outside contractors. Many building owners contract for at least some custodial and maintenance services. A building's asbestos work control/permit system, as described above, should also cover contract work.

At a minimum, contracts with service trades or abatement companies should include the following provisions to ensure that the service or abatement workers can and will follow appropriate work practices:

- Proof that the contractor's workers have been properly notified about ACM in the owner's building and that they are properly trained and accredited (if necessary) to work with ACM.
- Copies of respiratory protection, medical surveillance, and worker training documentation as required by OSHA, EPA and/or state regulatory agencies.
- Notification to building tenants and visitors that abatement activity is underway (performed by owner).
- Written work practices must be submitted by the vendor or contractor for approval or modification by the Asbestos Program Manager. The vendor or contractor should then agree to abide by the work practices as finally accepted by the Asbestos Program Manager.
- Assurance that the contractor will use proper work area isolation techniques, proper equipment, and sound waste disposal practices.
- Historical air monitoring data for representative examples of the contractor's previous projects, with emphasis on projects similar to those likely to be encountered in the building.
- Provisions for inspections of the area by the owner's representative to ensure that the area is acceptable for re-entry of occupants/tenants.
- A resume for each abatement contractor/supervisor or maintenance crew chief, known as the "competent person" in the OSHA standard and EPA Worker Protection Rule.
- Criteria to be used for determining successful completion of the work (i.e., visual inspections and air monitoring).
- Any other information deemed necessary by the owner's legal counsel.
- Notification to EPA (and other appropriate agencies) if the abatement project is large enough (see Chapter 6).

O&M Work Practices

The O&M program focuses on a special set of work practices for the custodial, maintenance, and construction staff. The nature and extent of any special work practices should be tailored to the likelihood that the ACM will be disturbed and that fibers will be released. In general, four broad categories of O&M work practices are recognized:

1. **Worker Protection Programs** — These work practices help ensure custodial and maintenance staff are adequately protected from asbestos exposure.
2. **Basic O&M Procedures** — Basic procedures are used to perform routine custodial and maintenance tasks that may involve ACM.
3. **Special O&M Cleaning Techniques** — Special techniques to clean up asbestos fibers on a routine basis.